

Claims

1. A method of manufacturing a firearm barrel, comprising:
 - providing an elongate thin-walled tubular insert member;
 - providing a rigid tubular sleeve sized to receive the insert member so that the sleeve supports and protects the insert member along at least a majority of the insert member;
 - inserting the insert member into the sleeve;
 - after inserting the insert member into the sleeve, supporting the insert member and sleeve in a molding machine; and
 - molding a casing over at least a portion of the sleeve.
2. A method in accordance with claim 1 in which:
 - the sleeve is rigid enough to withstand the step of molding without substantial bending or deformation; and
 - the sleeve is thick enough to protect the insert member from thermal and pressure effects of the molding of the casing, to thereby substantially prevent deformation of the insert member during the molding step.
3. A method in accordance with claim 1 in which the step of molding the casing includes injection molding a moldable material selected from the group consisting of:
 - (a) a polymer;
 - (b) a copolymer;
 - (c) a blend of a polymer and carbon fibers; and
 - (d) a glass reinforced polymeric material.
4. A method in accordance with claim 1 in which the insert member includes an outer diameter and the sleeve includes an inner diameter, and further comprising:
 - sizing the inner diameter of the sleeve slightly larger than the outer diameter of the insert member, to thereby allow a slip fit between the insert member and the sleeve.

5. A method in accordance with claim 1, further comprising connecting the insert member to the sleeve.

6. A method in accordance with claim 5 in which the connecting step precedes the step of molding the casing over the sleeve.

7. A method in accordance with claim 5 in which:
the sleeve includes an inner surface; and
the step of connecting the insert member to the sleeve includes applying an adhesive to the inner surface of the sleeve.

8. A method in accordance with claim 5 in which the insert member includes an outer surface and an outer diameter and the sleeve includes a bore having an inner surface, and further comprising:

reaming the bore of the sleeve so that the bore is sized approximately 0.003 inch greater than the outer diameter of the insert member; and

applying an adhesive to the inner surface of the sleeve or the outer surface of the insert member or both.

9. A method in accordance with claim 1 in which the inserting step includes press fitting the insert member into the sleeve.

10. A method in accordance with claim 1, further comprising providing a breech portion and connecting the insert member to the breech portion.

11. A method in accordance with claim 1, further comprising providing a muzzle portion and connecting the insert member to the muzzle portion.

12. A method in accordance with claim 1, further comprising:
providing a muzzle portion and a breech portion; and
positioning the muzzle portion and the breech portion at opposite ends of the insert member so that the sleeve is interposed between the muzzle portion and the breech portion; and

in which the molding step further includes molding the casing into engagement with at least part of the breech portion and at least part of the muzzle portion so that the casing tightly connects the muzzle portion to the breech portion.

13. A firearm barrel manufactured in accordance with the method of claim 1.

14. A method of manufacturing a firearm barrel, comprising:

- providing an elongate tubular insert member;
- providing a tubular sleeve sized to receive the insert member so that the sleeve supports the insert member along at least a portion of the insert member;
- inserting the insert member into the sleeve, thereby forming a sleeve-insert subassembly;
- providing a molding machine including a mold cavity, the mold cavity being sized to receive the sleeve-insert subassembly such that no portion of the insert member is exposed to the cavity;
- supporting the sleeve-insert subassembly in the molding machine so that at least part of the sleeve-insert subassembly extends into the mold cavity;
- filling the mold cavity with a moldable material to encase at least part of the sleeve, the sleeve substantially preventing the moldable material from contacting the insert member; and
- holding the moldable material within the mold cavity until it is substantially solid, thereby forming a casing over at least a portion of the sleeve.

15. A method in accordance with claim 14 in which the sleeve is rigid enough and thick enough to protect the insert member from deforming or warping during the filling of the mold cavity.

16. A method in accordance with claim 14 in which the moldable material is selected from the group consisting of:

- (a) a polymer;
- (b) a copolymer;
- (c) a blend of a polymer and carbon fibers; and
- (d) a glass reinforced polymeric material.

17. A method in accordance with claim 14, further comprising connecting the insert member to the sleeve.

18. A method in accordance with claim 17 in which:
the sleeve includes an inner surface; and
the step of connecting the insert member to the sleeve includes applying an adhesive to the inner surface of the sleeve.

19. A method in accordance with claim 14, further comprising:
providing a muzzle portion and a breech portion; and
before filling the mold cavity, inserting the muzzle portion and the breech portion over opposite ends of the insert member so that the sleeve is interposed between the muzzle portion and the breech portion; and
in which the step of filling of the mold cavity includes forming the casing over at least part of the breech portion and at least part of the muzzle portion so that the casing tightly connects the muzzle portion to the breech portion.

20. A firearm barrel manufactured in accordance with the method of claim 14.

21. A firearm barrel comprising:
a rigid elongate tubular sleeve including a bore, a breech portion at a first end of the sleeve, and a muzzle portion at a second end of the sleeve opposite the first end;
an elongate thin-walled insert member supported in the bore of the sleeve;
and
a casing that tightly connects the breech portion to the muzzle portion.

22. A firearm barrel in accordance with claim 21 in which the casing is molded over at least a portion of the sleeve.

23. A firearm barrel in accordance with claim 22 in which the casing is molded of a moldable material selected from the group consisting of:
(a) a polymer;
(b) a copolymer;

- (c) a blend of a polymer and carbon fibers; and
- (d) a glass reinforced polymeric material.

24. A firearm barrel in accordance with claim 21 in which the insert member is connected to the sleeve.

25. A firearm barrel in accordance with claim 24, further comprising an adhesive material that bonds the insert member to the sleeve.

26. A firearm barrel in accordance with claim 24, in which the insert member is press fit into the sleeve.

27. A firearm barrel in accordance with claim 21, in which the muzzle portion includes a stem having serrations.

28. A firearm barrel in accordance with claim 27 in which the casing is molded into engagement with the serrations of the stem to prevent relative longitudinal movement between the muzzle portion and the casing.

29. A firearm barrel in accordance with claim 21, in which the breech portion includes a stem having serrations.

30. A firearm barrel in accordance with claim 29 in which the casing is molded into engagement with the serrations of the stem to prevent relative longitudinal movement between the breech portion and the casing.

31. A firearm barrel in accordance with claim 29, in which the stem defines an interior bore sized to receive an end of the sleeve and the sleeve is inserted into the bore, thereby eliminating a shear point between the breech portion and the sleeve.

32. A firearm barrel in accordance with claim 21, in which the breech portion and the sleeve partially overlap along the length of the insert, to thereby eliminate a shear point between the breech portion and the sleeve.

33. A firearm barrel in accordance with claim 21, in which the sleeve is formed of steel or aluminum.

34. A firearm barrel in accordance with claim 21 in which the casing is molded of a material that shrinks when molded to thereby generate a tension that pulls the breech portion and the muzzle portion toward each other.

35. A firearm barrel in accordance with claim 34 in which the tension is opposed by a compression force exerted on the sleeve.